

CHAPTER 7

WASTEWATER AND WATER

INTRODUCTION

This chapter describes wastewater generation and water use for the Project. The Project Area has direct access and is connected to municipal water and sewer infrastructure. The City of Quincy is a Massachusetts Water Resources Authority (MWRA) community for both water and sewer.

WASTEWATER

Existing Conditions Wastewater

Existing Wastewater Generation

The existing Project Area is comprised of various uses which have been analyzed for sewer generation. Flow rates have been applied to each use as established by the Massachusetts Department of Environmental Protection in 314 CMR 7.15 "Calculation of Flows for Sewer Extension or Connection Permits".

The entire 31-acre Project Area generates approximately 200,100 gallons per day (gpd). Since the Project Area will include existing uses and buildings to remain, for the purposes of comparison, the flow generation rates include the redeveloped areas, which consist of existing buildings to be razed. The redeveloped existing conditions generates approximately 141,000 gpd of wastewater. Table 7.1 provides a breakdown of the wastewater generation for each use to be redeveloped.

Table 7.1
Existing Wastewater Generation Rates¹

Use	Generation Rate ¹	Existing
Office	366,089 GSF of Office @ 75gpd/ 1,000 SF	27,457 gpd
Retail	261,399 GSF of Retail @ 50gpd/ 1,000 SF	13,070 gpd
Supermarket	7,945 GSF @ 97gpd/1,000 SF	771 gpd
Restaurants	2,749 seats @ 35 gpd per seat	96,215 gpd
Movie Theatre²	882 seats @ 3 gpd/ seat	2,646 gpd
Structured Parking Spaces	842 parking spaces @ 1 gpd/ space	842 gpd
Total Flow		141,000 gpd

¹Based on 314 CMR 7.15 Calculation of Flows for Sewer Extension or Connection Permits

²Movie theatre seats assumed to be equal to one seat per 24 sf

Existing Wastewater Infrastructure

The City of Quincy Department of Public Works (DPW) owns and operates the municipal sewer system, which is comprised of approximately 220-miles of sewer infrastructure. The City is a MWRA sewer community which discharges wastewater into the MWRA high level sewers at eight (8) locations throughout the City. The MWRA meters the City discharge into high level sewers and bills the City based on actual flow readings. The MWRA high level sewers convey flows to Nut Island Headworks in Quincy where the flows are then conveyed through the Inter-Island Tunnel to the MWRA's Deer Island Wastewater Treatment Facility.

The existing buildings within the Project area connect to the City's municipal sewer system at multiple locations within each roadway Right-of-Way (ROW). Wastewater from areas outside the Project area to the north, northwest, and southwest are conveyed through the Project Area. Generally, the Quincy Center Area wastewater is collected by a network of eight-inch gravity sewer pipes that eventually flow into a 24-inch by 36-inch box sewer within the McGrath Highway ROW. Wastewater then flows in a northerly direction towards Merrymount Park to the MWRA Quincy Pump Station, where flow is pumped into the MWRA High Level Sewer Interceptor in the area of Greenleaf Street. Refer to Figure 7.1 for the existing layout of the sewer system for the Quincy Center Area.

Based on discussions with the DPW, there are existing sewer problems related to excessive age, collapse and grease loading within the Project area. There are no reported capacity issues with the sewer trunk lines downstream of the project area to the MWRA Quincy Pump Station. Sewer infrastructure within the Quincy Center Area is approximately 114-years old in some locations.



In May 2011, Woodard & Curran, consultants to the City, prepared a Sewer System Evaluation Survey (SSES) to identify and prioritize areas within the City with the large infiltration and inflow (I/I) problems. The SSES included review of past sewer studies, flow metering, manhole and pipeline inspections and tidal influences. Flow metering consisted of analysis of fifteen flow meters over a ten-week period to monitor specific areas for I/I problems. Manhole inspections have included over 500 coastal manholes since 2009.

Additionally, the Redeveloper monitored flow within the Quincy Center Area at four locations in 2009 to determine existing capacity and flows with the Project Area. Three meters were installed at the upstream boundaries of limits of the Project Area to determine flows that are to be conveyed through the Project Area under proposed conditions and the fourth meter to determine flows within the 24"x36" culvert within the McGrath Highway ROW, where all flow eventually is conveyed. Refer to Figure 7.1 for flow meter locations.

MWRA coordination has included discussions regarding the capacity of the Quincy Pump Station, which is owned and operated by the MWRA. The MWRA is currently modeling the proposed flows to see impacts to the pumping station during high demand periods. According to the MWRA the pump station was replaced in 2002 and the force main discharging into the high level sewer was lined in 1999.

Proposed Conditions Wastewater

Proposed Wastewater Generation

The proposed redevelopment building program is estimated to generate approximately 525,207 gpd of wastewater, an overall net increase of approximately 384,207 gpd. Refer to Table 7.2 for wastewater generation associated with the Project.

Table 7.2
Proposed Wastewater Generation Rates¹

Use	Generation Rate ¹	Flow
Office	1,005,558 GSF of Office @ 75gpd/ 1,000 SF	75,417 gpd
Retail	250,250 GSF of Retail @ 50gpd/ 1,000 SF	12,513 gpd
Supermarket	54,215 GSF @ 97gpd/1,000 SF	5,259 gpd
Regional Shopping/Superstore	130,753 GSF @ 50gpd/1,000 SF	6,538 gpd
Classroom²	159,466 GSF @ 75gpd/ 1,000 SF	11,960 gpd
Residential³	1,883 residential units @ 110 gpd per bedroom (assume 1.3 bedrooms/ unit)	269,269 gpd
Health Club	337 Lockers @ 20 gpd per locker	6,740 gpd
Hotel	173 keys @ 110 gpd per key	19,030 gpd
Restaurants	2,975 seats @ 35 gpd per seat	104,131 gpd
Movie Theatre⁴	3,210 seats @ 3 gpd/ seat	9,630 gpd
Structured Parking Spaces	4,721 parking spaces @ 1 gpd/ space	4,721 gpd
Total Flow		525,207 gpd

¹Based on 314 CMR 7.15 Calculation of Flows for Sewer Extension or Connection Permits

²Class room demand conservatively assumed to be equal to office demand

³1.3 bedrooms assumed per residential Unit

⁴Movie theatre seats assumed to be equal to one seat per 24 sf

Proposed Wastewater Infrastructure

The proposed wastewater infrastructure will include a network of new and upgraded sewer manholes, grease traps, oil and gas separators, and piping within the Project Area. To facilitate the new building program and to bring infrastructure to current standards, the majority of the existing infrastructure is being re-built. Sewer mains will be 8-inch to 18-inch polyvinyl chloride (pvc) pipe. Refer to Figure 7.2 for the proposed sewer infrastructure improvements.

The proposed sewer network within the Project Area was analyzed using Autodesk Storm and Sanitary Analysis software to determine adequate pipe sizes and capacity for the Project. The Project is a mixed-use development, therefore, a peaking factor of 2.5 was applied to the wastewater generation rates for the analysis, which produces a peak daily flow of approximately 1.5 MGD for the entire project area (including existing building program to remain in addition to proposed program).



According to flow meter results from the SSES report for the City infrastructure, there are no reported sanitary sewer overflows (SSO's) along the trunk line downstream of the Project Area. Existing flows were monitored in the receiving downstream sewer trunk lines and flows ranged from a minimum of 0.68 MGD to a peak of 1.17 MGD, with an average of 0.94 MGD during dry weather and peaks to approximately 8.9 MGD during heavy rain events. Based on the net increase of flow (0.40 MGD average, 1.0 MGD peak) generated by the Project compared to the capacity of the 24"x36" sewer trunk line (8.6± MGD), there is adequate capacity to convey the additional net new wastewater to the MWRA Quincy Pump Station.

MWRA is currently analyzing the projected wastewater flow effects on the Quincy Pump Station. Should modeling capacity problems arise, I/I mitigation associated with the Project can be performed within the contributing Quincy Pump Station sub-basins. Additionally, the City of Quincy has no capacity limitations to discharge into the MWRA system.

Mitigation Summary

Infrastructure Improvements

The Project will construct approximately 4,900-feet of new sewer pipe including approximately forty (40) manholes, and external grease traps for restaurants. Additionally, parking garages will be pretreated with oil and gas separators prior to flow entering the municipal sewer network. The infrastructure improvements will replace existing sewer infrastructure which was installed as far back as the 1890's and many areas upgraded in the 1920's and 1970's.

Infiltration and Inflow (I/I) Reduction

As confirmed by the 2011 SSES, the City of Quincy has a significant I/I within the sewer network. The City of Quincy average water withdrawal from the MWRA is approximately 9.5 MGD. According to the SSES, there is an estimated 9.4 MGD of infiltration and 49.7 MGD of inflow during periods of precipitation.

The City is currently working with Woodard & Curran to identify inflow and infiltration (I/I) removal projects within the City. The SSES identified priority areas within the City that are prone to elevated levels of I/I. Phase I of the program consisted of manhole inspections and rehabilitation along the coastal areas of the City, with construction in 2010 and 2011. Phase IIA and IIB are ongoing and include manhole and pipe rehabilitation. The I/I program identifies I/I projects and proposes the removal of I/I, which is funded by development projects or through the City's I/I fund or projects can be undertaken by developers to mitigate proposed new flows generated by proposed projects. The City currently has approximately 575,000 gallons of I/I identified, however the City is likely to move forward with the removal of this flow from the municipal sewer system prior to the completion of the MEPA process for the Project. Therefore, the Project mitigation will rely upon future I/I projects identified by the City's ongoing I/I Identification Program. The Quincy Center Redevelopment Project will be required to mitigate net new flow at a 4:1 ratio, or the removal of 1,536,828 gallons of I/I based on the proposed net new sewer flow of 384,207 gpd.

Coordination with MassDEP included a meeting to discuss the I/I mitigation for the Project and potential changes to sewer connection permits. Due to longevity and phasing of the Project and the significant I/I available to be removed within the City, MassDEP agreed that a phased I/I mitigation plan and taking on I/I projects that the ongoing program identifies would be appropriate.

In general, the following outlines the mitigation strategy for I/I removal for the Project.

- Hancock Adams Associates (HAA, selected Redeveloper) be credited with I/I removal for sewer infrastructure improvement projects that eliminate identified I/I problems.
- HAA will coordinate with the City and their Consultant to fund specific I/I removal projects that have been identified by the City's I/I program. The cost of these removal projects will be paid directly by HAA, and the I/I gallons removed from these projects credited towards the Project mitigation.
- HAA will fund sufficient I/I mitigation projects to support the phased construction, or Steps, outlined in Table 7.3, with funding being provided towards I/I removal projects sufficient to mitigate I/I associated with each Step, with the agreed upon mitigation being completed prior to the issuance of a certificate of occupancy by the City of Quincy.
- I/I removal projects used to mitigate this Project can be located anywhere within the Quincy, however, with a focus on the Quincy Center Redevelopment sewer sub-catchment area.

According to the redevelopment program, Table 7.3 presents a summary of I/I mitigation required for each Step (Phase) of development.

Table 7.3 I/I Mitigation Phasing				
Step (Phase)	Anticipated Dates	Development Blocks	Net New Wastewater Flow	Required I/I Removal
Step 1	2013-2015	7, 8, 9, 11	94,100 GPD	376,398 GPD
Step 2	2015-2018	3, 4, 5, 6a, 6c, 10	233,844 GPD	935,376 GPD
Step 3	2018-2020	1, 6b	56,263 GPD	225,051 GPD

WATER

Existing Conditions Water

Existing Water Supply and Demand

The Massachusetts Water Resources Authority (MWRA) supplies water to the City of Quincy. The MWRA water supply is provided primarily from the Quabbin and Wachusett Reservoirs, which



stores a combined 477 billion gallons of water and can supply a safe yield of approximately 300 million gallons per day (MGD) to the communities supplied by the MWRA. The average daily withdrawal for 2010 for all of the MWRA communities was approximately 204.3 MGD, well below the 300 MGD safe yield. MWRA does not limit the City to a maximum daily withdrawal. As indicated in the 2010 Annual Water Report, the average daily demand for the City in 2010 was 9.2 MGD, and trending downward to approximately 9.0 MGD according to preliminary 2011 reports provided by MWRA's website. Refer to Appendix E for MWRA data.

The existing Project Area is comprised of various uses which has been analyzed for water use. The existing water use is estimated at 110% of the estimated wastewater generation. As noted in the wastewater section above, different flow rates have been applied to each use based on flow rates established by the Massachusetts Department of Environmental Protection in 314 CMR 7.15 "Calculation of Flows for Sewer Extension or Connection Permits".

Based on 110% of the existing estimated wastewater flow, the existing Project Area's water demand is estimated at 219,345 gpd. Since the Project Area will include existing uses and buildings to remain, for the purposes of comparison, the existing conditions that are to be developed are included in the flow analysis. The existing conditions to be redeveloped within the Project Area, consisting of buildings to be razed, consumes approximately 154,174 gpd of domestic water (See Table 7.4).

Table 7.4 Existing Water Demand			
Use	Projected Wastewater Flow (gpd) ¹	Anticipated Water use Factor	Water Demand (gpd)
Office	27,457	1.1	30,202
Retail	13,070		14,377
Supermarket	771		848
Restaurant	96,215		105,837
Movie Theatre	2,646		2,911
Total Water Demand			154,174

¹Based on 314 CMR 7.15 Calculation of Flows for Sewer Extension or Connection Permits

In 2008, two hydrant flow tests were performed by Vanasse Hangen Brustlin to determine the existing flow and pressure of the water supply network within the Project Area. Tests were conducted at the corner of Mayor Hannon Parkway (formerly Revere Rd) and Dennis F. Ryan Parkway, and near the intersection of Granite Street and Ross Way, with flows of 3,719 gallons per minute (gpm) and 3,392 gpm when converted to a base of 20 pounds per square inch (psi).



Results of the test show adequate flow and pressure within the network surrounding the Project Area.

Additionally, flow tests provided by a City water infrastructure report prepared by Woodard & Curran, showed flow test results ranging from 4,200 gpm to 7,478 gpm for three tests within the Project Area. Refer to Appendix E for hydrant flow test data.

Existing Water Infrastructure

The City of Quincy Department of Public Works maintains and operates approximately 228 miles of water distribution mains that provide service to approximately 23,000 connections throughout the entire City.¹ Refer to Appendix E for City of Quincy water data.

The existing water infrastructure within the Project Area consists of a network of primarily ductile iron pipes generally within the public right-of-ways, ranging in size from eight-inches to twenty-inches. The existing water infrastructure is approximately 86-years old in some locations. Refer to Figure 7.3 for the Existing Water System and Table 7.3 for the Existing Water Demand.

Proposed Conditions Water

Proposed Water Demand

The Project is estimated to have a water demand of approximately 572,536 gpd, an overall increase of approximately 418,362 gpd. The anticipated water use is estimated at 110% of the projected wastewater generation. Refer to Figure 7.4 for the Proposed Water System and Table 7.5 for the estimated water demand based on the various uses proposed.

¹ 2010 Annual Water Report, Massachusetts Water Resource Authority (MWRA), Letter to Quincy Water Customers from City of Quincy Water Superintendent, Peter Hoyt.

**Table 7.5
Proposed Water Demand**

Use	Projected Wastewater Flow (gpd) ¹	Anticipated Water use Factor	Water Demand (gpd)
Office	75,417	1.1	82,959
Retail	12,513		13,764
Supermarket	5,259		5,785
Regional Shopping/Superstore	6,538		7,192
Classroom ²	11,960		13,156
Residential ³	269,269		296,196
Health Club	6,740		7,414
Hotel	19,030		20,933
Restaurants	104,131		114,544
Movie Theatre ⁴	9,630		10,593
Total Water Demand			572,536

¹Based on 314 CMR 7.15 Calculation of Flows for Sewer Extension or Connection Permits

²Class room demand conservatively assumed to be equal to office demand

³1.3 bedrooms assumed per residential Unit

⁴Movie theatre seats assumed to be equal to one seat per 24 sf

The MWRA conducted preliminary modeling of the proposed water demand on the MWRA network. A peaking factor of 1.75 was applied to the average daily demand to get a peak daily demand of 765,000 gpd. Results of the MWRA modeling show a slight change in how long the supply lines are closed during higher demand periods, however, this impact is not considered negative. Refer to Appendix E for correspondence with MWRA staff on water capacity.

The proposed water demand is a conservative estimate based on the Proponents commitment for LEED-ND certification. LEED-ND requires the Project to use low flow fixtures and energy star compliant appliances. It is anticipated that the water demand will be lower than shown in Table 7.4, which ultimately will result in lower wastewater flows.

The irrigation for the Project will be supplied by the municipal system. The landscape design will include low maintenance, native plant and drought tolerant species to minimize need for irrigation. The vast majority of the area is urban-style with many hardscape features, not requiring irrigation. Based on the U.S. Department of Energy, "Guidelines for Estimating Unmetered Landscaping Water Use", July 2010, it is estimated that the Project will require



approximately 382,815 gallons per year of irrigation supply, or 1,550 gallons per day when average over an 8-month watering cycle. Additional irrigation supply methods will be analyzed as the site design progresses and specific tenant requests and requirements for alternatives methods in and adjacent to their respective site. Refer to Appendix E for irrigation demand calculations.

Proposed Water Infrastructure

The proposed water infrastructure will include a network of new ductile iron pipe within the Project Area. To facilitate the new building program, the majority of the existing infrastructure is being re-built. Water mains will be twelve-inch to twenty-inch ductile iron pipe. Approximately 4,800-feet of new water pipe and associated structures (gates, valves and hydrants) will be installed for the redevelopment Project.

According to the existing flow tests presented in the previous section, the City infrastructure surrounding the Project Area provides adequate capacity and pressure for the proposed redevelopment.

Mitigation Summary

Infrastructure Improvements

The Project will construct approximately 4,800-feet of new ductile iron water pipe, including all associated gates, valves and hydrants. The infrastructure improvements will replace existing water infrastructure that dates back to the 1920's in some locations.

Water Efficiency

The Proponents have committed to constructing the Project in accordance with the USBGC LEED-ND 2009 rating system, which promotes the use of efficient energy and water use in the buildings and Project Area. The Project will include the use of: low-flow plumbing fixtures including at a minimum, all toilets and urinals will conform with the Massachusetts Plumbing Code Ultra Low Flush (ULF) standard 1.6 gallons per flush; specification of faucet aerators and low-flow shower heads as appropriate; and the use of automatic shutoff valves.

Alternative methods for open space irrigation will be evaluated as specific buildings and tenant requirements are determined.

REQUIRED PERMITS AND REGULATORY COMPLIANCE

Table 7.5 presents a summary of the required permits and regulatory compliance the Project must obtain and comply with.

Table 7.5
Anticipated Permits and Regulatory Compliance

Agency	Permit	Status
Federal		
U.S. Environmental Protection Agency	NPDES Construction General Permit	To be filed prior to the start of construction
Commonwealth of Massachusetts		
Department of Environmental Protection	BRP WP 74 Sewer Connection for Discharge Greater than 50,000 GPD	To be filed prior to the start of construction
Department of Environmental Protection	Compliance with 360 CMR 10.016 Oil/Gas Separators	N/A
Department of Environmental Protection	Compliance with 248 CMR 2.00 Board of State Examiners of Plumbers and Gas Fitters	N/A
Massachusetts Water Resources Authority	Toxic Reduction and Control Group (TRAC) Permitting	To be filed prior to the start of construction
City of Quincy		
Title 13 - Public Services Ordinance	13.12 – Utilities Permitting	To be filed prior to the start of construction

MITIGATION SUMMARY

Mitigation for the Project includes infrastructure improvements for both the water supply system and sewer system. New infrastructure will replace and upgrade the existing aging City infrastructure.

Wastewater mitigation also includes the I/I removal at 4:1 ratio, removing approximately 1,536,828 gallons from the City network, which ultimately discharges into the MWRA system.

Water use will further be reduced by the Proponents commitment to using water efficient fixtures, energy star compliant appliances, and additional water efficiency measures reflective of credits associated with LEED-ND certification.

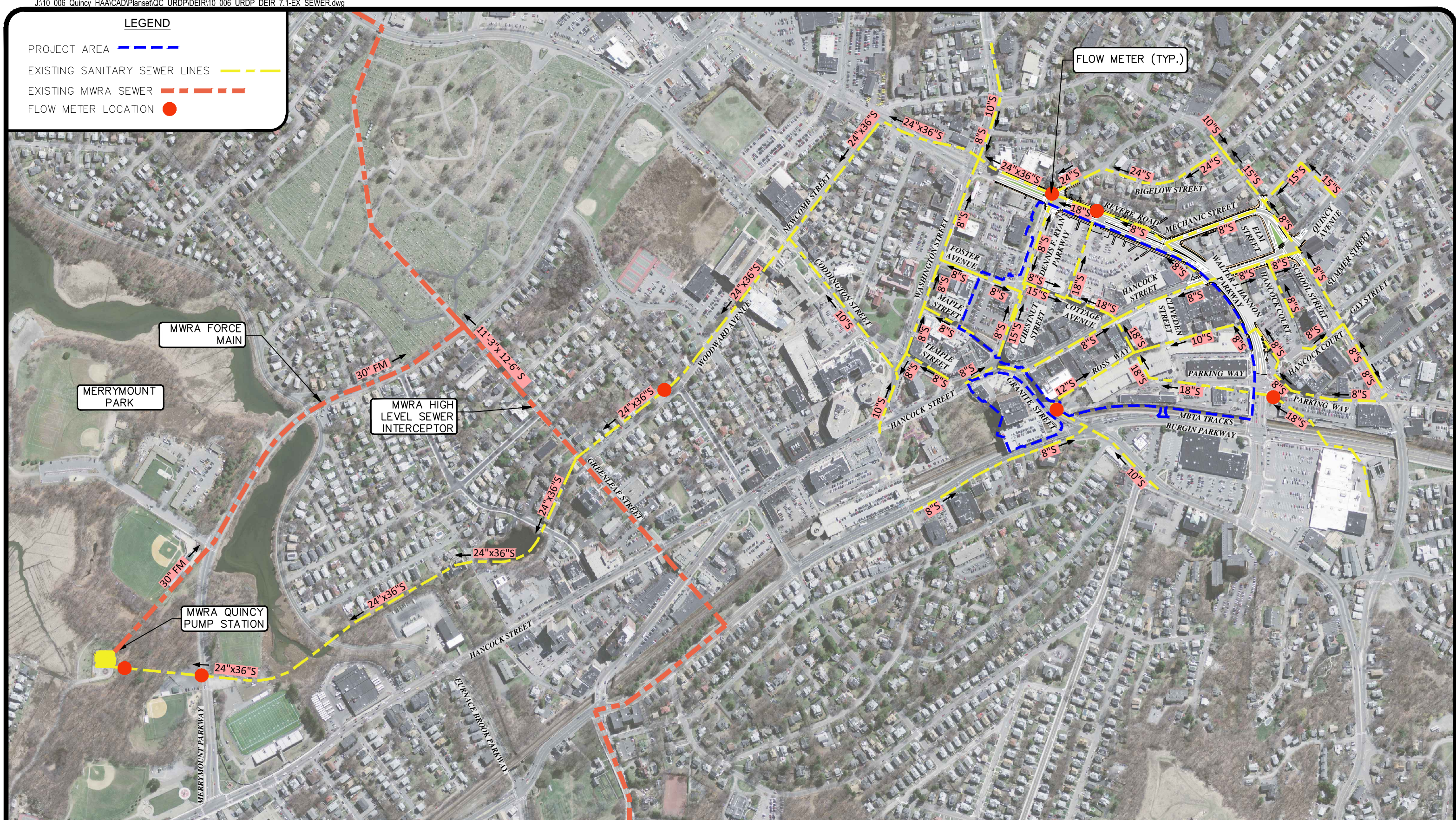
CONCLUSION

The Project is anticipated to generate approximately 525,207 gpd of wastewater, an overall net increase of approximately 384,207 gpd over existing conditions. The Project proposes upgraded and new sewer infrastructure within the Project Area, including 4,900-feet of sewer trunk lines and laterals. Flow will be mitigated by removing I/I identified throughout the City at a ratio of 4:1, removing a total of 1,536,828 gallons.

The Project is estimated to have a water demand of approximately 572,536 gpd, an overall increase of approximately 418,362 gpd over existing conditions. The Project proposes new water infrastructure within the Project Area, including 4,800-feet of water main. Water reduction methods are also anticipated including, water efficient fixtures and energy star compliant appliances.

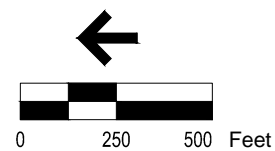
LEGEND

- PROJECT AREA ———
- EXISTING SANITARY SEWER LINES ———
- EXISTING MWRA SEWER ———
- FLOW METER LOCATION ●



NOTES:

1. EXISTING SEWER CONFIGURATION AND SIZES COMPILED FROM AVAILABLE RECORD INFORMATION, CITY OF QUINCY GIS INFORMATION, DISCUSSIONS WITH CITY OF QUINCY STAFF AND THE FIELD SURVEY.
2. SEWER INFRASTRUCTURE SHOWN ONLY FROM PROJECT AREA TO DISCHARGE INTO MWRA HIGH LEVEL SEWER INTERCEPTOR.



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Suite 600
Boston, MA 02210

Figure 7.1

April 30, 2012

Existing Wastewater System
Draft Environmental Impact Report
New Quincy Center Redevelopment
Quincy, Massachusetts

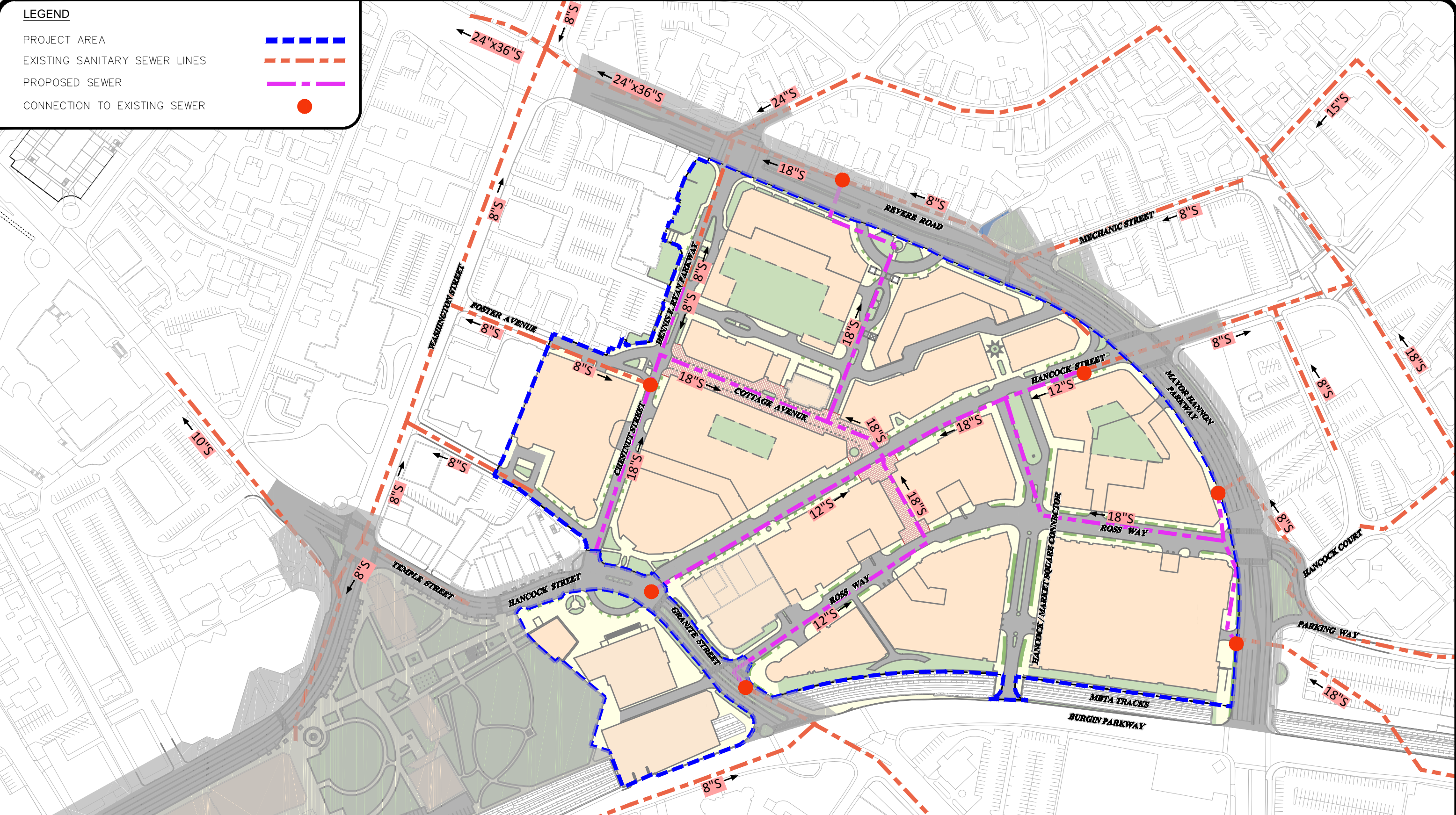
LEGEND

- PROJECT AREA

EXISTING SANITARY SEWER LINES

PROPOSED SEWER

CONNECTION TO EXISTING SEWER
-

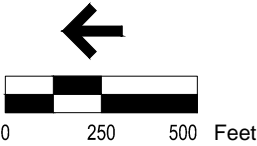


NOTES:

1.

2.
- EXISTING SEWER CONFIGURATION AND SIZES COMPILED FROM AVAILABLE RECORD INFORMATION, CITY OF QUINCY GIS INFORMATION, DISCUSSIONS WITH CITY OF QUINCY STAFF AND THE FIELD SURVEY.

SEWER INFRASTRUCTURE SHOWN ONLY FROM PROJECT AREA TO DISCHARGE INTO MWRA HIGH LEVEL SEWER INTERCEPTOR.



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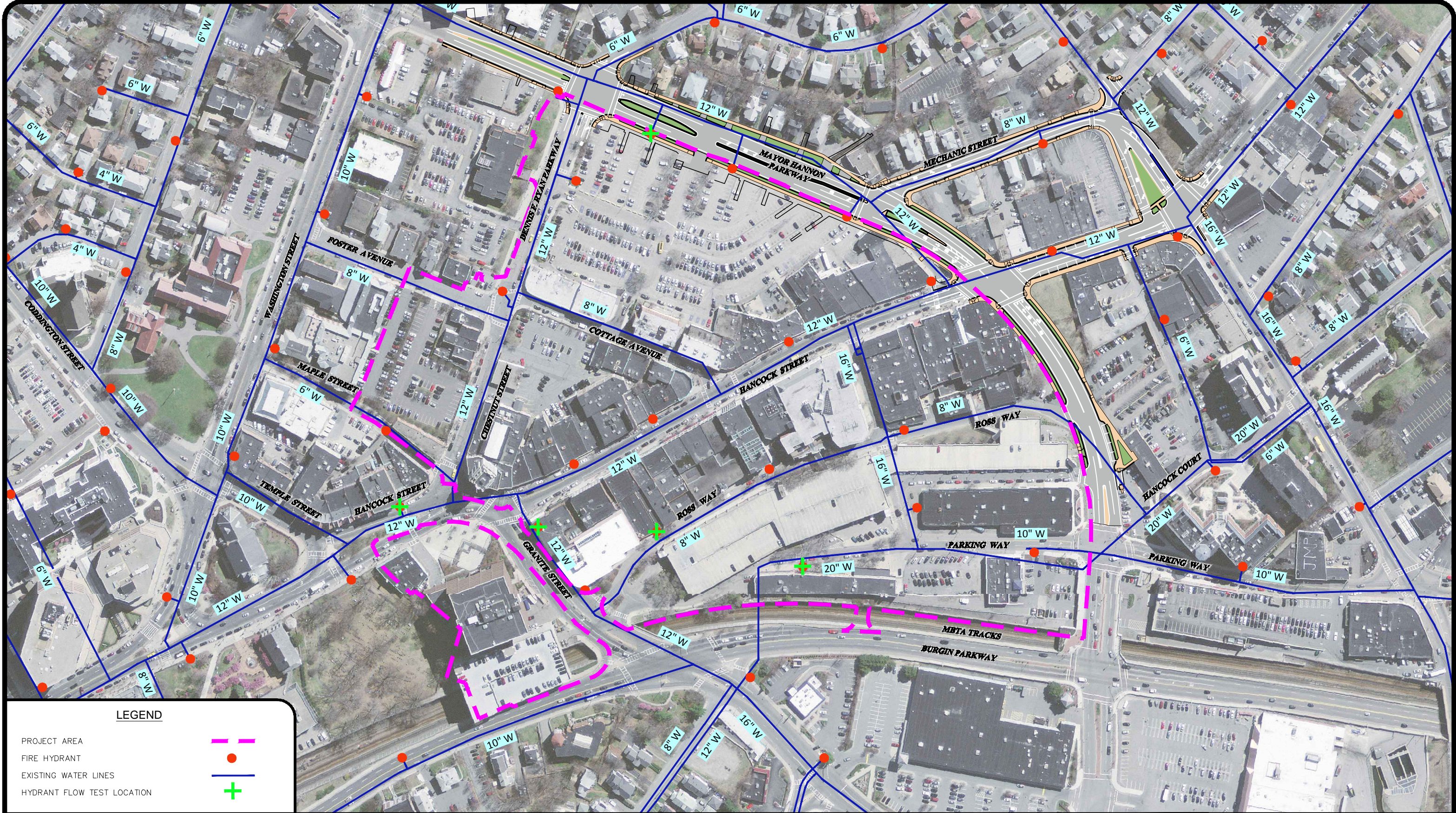
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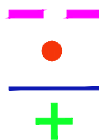
Figure 7.2
April 30, 2012

Proposed Wastewater System
Draft Environmental Impact Report
New Quincy Center Redevelopment
Quincy, Massachusetts



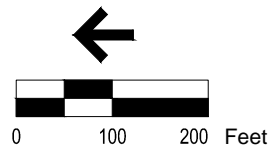
LEGEND

PROJECT AREA
FIRE HYDRANT
EXISTING WATER LINES
HYDRANT FLOW TEST LOCATION



NOTES:

1. EXISTING WATER CONFIGURATION AND SIZES COMPILED FROM AVAILABLE RECORD INFORMATION, CITY OF QUINCY GIS INFORMATION, DISCUSSIONS WITH CITY OF QUINCY STAFF AND THE FIELD SURVEY.



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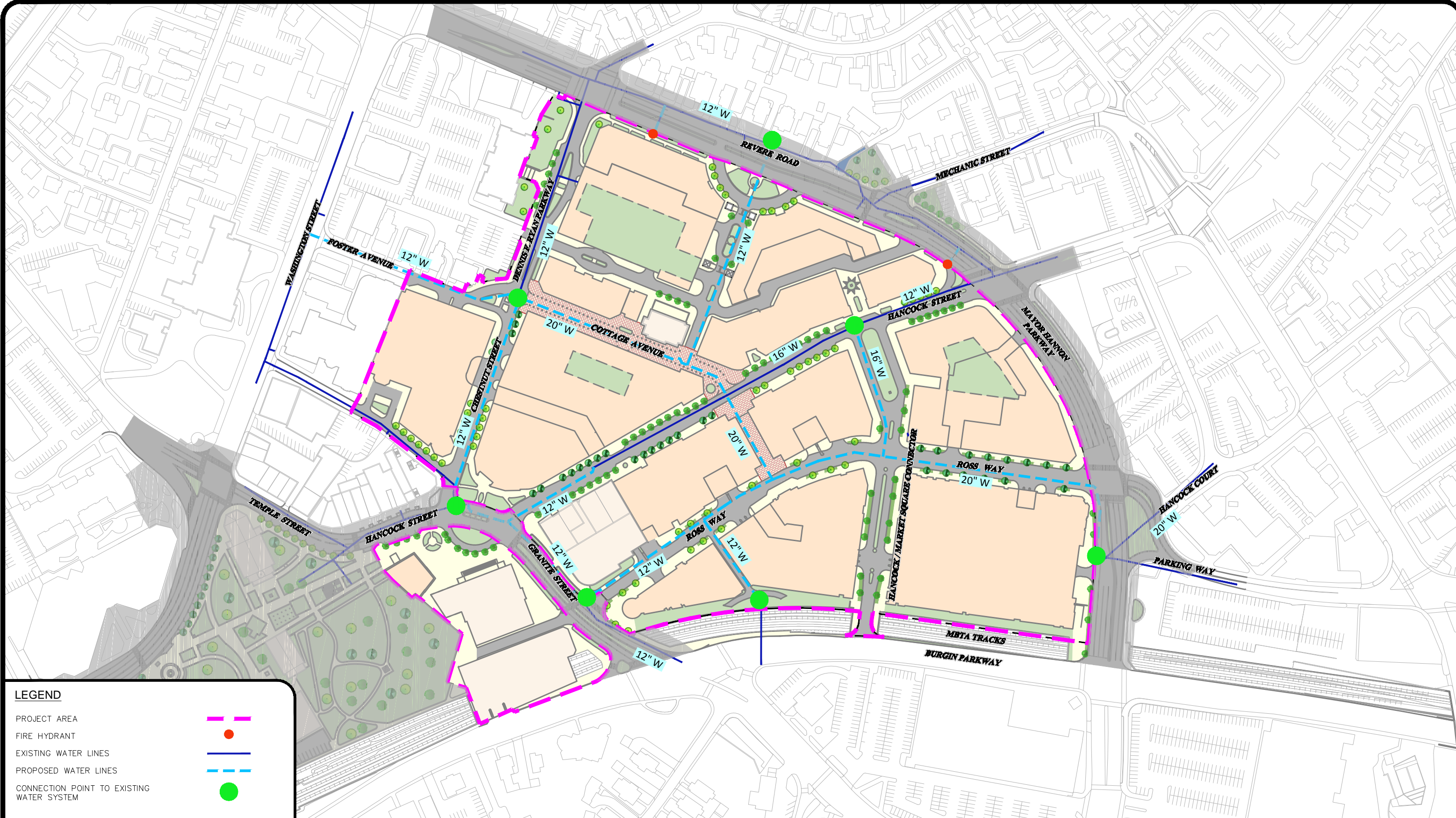


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Figure 7.3

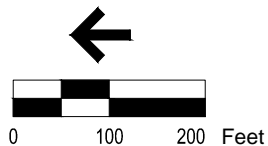
April 30, 2012

Existing Water Supply System
Draft Environmental Impact Report
New Quincy Center Redevelopment
Quincy, Massachusetts



LEGEND

- PROJECT AREA
- FIRE HYDRANT
- EXISTING WATER LINES
- PROPOSED WATER LINES
- CONNECTION POINT TO EXISTING WATER SYSTEM



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Figure 7.4

April 30, 2012

Proposed Water Supply System
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Quincy, Massachusetts